RESEARCH NOTE 84-12

MAINTENANCE PERFORMANCE SYSTEM (ORGANIZATIONAL) A MODEL FOR UNIT OJT AND MECHANIC CERTIFICATION

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U. S. Army

Research Institute for the Behavioral and Social Sciences

January 1984

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Research Note 84-12	2. GOVT ACCESSION NO. AD-A138440	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Maintenance Performance System (Organizational) A Model for Unit OJT and Mechanic Certification		5. TYPE OF REPORT & PERIOD COVERED Contractor Report 6. PERFORMING ORG. REPORT NUMBER TR465-19
7. AUTHOR(s) Henry K. Simpson & Walter R. Harper		8. CONTRACT OR GRANT NUMBER(s) MDA 903-81-C-0032
9. PERFORMING ORGANIZATION NAME AND ADDRESS Anacapa Sciences, Inc. Drawer Q Santa Barbara, CA 93102		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 2Q263743A794
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Research Institute for the Behavioral & Social Sciences 5001 Eisenhower Ave. Alexandria, VA 22333		12. REPORT DATE January 1984 13. NUMBER OF PAGES 47
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

This project was monitored technically by Dr. Michael Drillings and Dr. Melissa Berkowitz

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Maintenance, Management Information System, Maintenance Training

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The purpose of this project is to develop the Maintenance Performance System-Organizational (MPS-O) which is an integrated system for measuring maintenance performance, diagnosing performance problems, taking corrective actions and providing training. This document describes the development and components of a model for conducting unit on-the-job maintenance training. The model also describes procedures for recognition and certification of qualified mechanics.

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INTRODUCTION

This report presents a model for conducting maintenance-related OJT (on-the-job training) in battalion and company-sized Army combat units. It also presents the analyses and discusses the factors that led to the development of the model. The model may be viewed as a framework for accomplishing the functions necessary to achieve effective OJT. The model therefore describes methods for identifying training requirements, delivering training, evaluating performance, and providing formal recognition for skills that have been attained. The functions involving these methods are not unique to this OJT model but are intrinsic to any integrated training system. However, in the present instance, the functions must be accomplished within the constraints of an operating Army unit and be directed toward the ultimate goal of increasing maintenance effectiveness.

The work described in this report derives from the Year One project work directed toward the definition of training guidelines applied to selected OJT tasks, work that is described in TR 465-10.[1] That work focused on the cognitive and motor skills used in OJT on maintenance tasks. The Year Two work, described in the present report, provides an operational framework for conducting OJT.

DEFINITION OF OJT

On-the-job training is defined differently in different contexts. Many members of the Army consider the term to mean work exposure, without any structured attempt to impart knowledge or skill. The official definition of the term[2] is more restrictive, however:

> A training process whereby students or trainees acquire knowledge and skills through actual performance of duties under competent supervision, in accordance with an approved, planned program.

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[1] McCallum, M. C., & Harper, W. R. **Maintenance performance systems (organizational). Training guidelines applied to selected OJT tasks.** Santa Barbara, California: Anacapa Sciences, Inc., Technical Report 465-10, August 1981.

[2] **AR 310-25, Dictionary of United States Army terms.** Washington, DC: U.S. Army, 1977.

This definition implies that OJT involves a structured program to systematically impart knowledge and skill on the job. Such training, though centered in the workplace, involves more than job exposure alone.

The U.S. Air Force defines OJT more broadly:[3]

> On-the-job training is a planned training program designed to qualify airmen, through self-study and supervised instruction, to perform in a given AFS (Air Force Specialty) while actually working in a duty assignment of their AFS.

Air Force OJT encompasses **any** training the airman receives while working in a duty assignment, whether centered in the workplace or not.

The other armed services tend not to use the term OJT, but have functional equivalents that refer to training that occurs after the serviceman begins working at his military specialty. The vagueness of the OJT term can produce serious problems in understanding.

Our definition of OJT is **training that occurs outside formal schools, in the working environment, with the supervisor as trainer, on actual equipment, on work flowing through the shop.** The essence of such training is that the supervisor imparts knowledge and skill to a less-experienced mechanic in the course of performing normal shop work. Additionally, such training does not usually entail extensive trainer preparation, lesson plans, or disruption of shop workflow. In other words, the trainer must be ready to train at any time, on any job. Such training can in principle occur on every job being performed, whether in garrison or field. This definition agrees with the Army's, but does not require a special program for each training task. Rather, training occurs on, potentially, all work being performed in the shop.

Our definition is more restrictive than that of the Air Force. We do not consider non "hands-on" training as meeting our definition of the term.

Preview of the OJT Model

The OJT Model and the analyses upon which it is based are described in detail in this report. The principal features of this model require that:

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[3] AFR 50-23. **Training: On-the-job training.** Washington, DC: U.S. Air Force, 1979.

- **A battalion maintenance panel is established.** The panel consists of the battalion executive officer, motor officer, and maintenance technician, and meets weekly to define and rank maintenance training requirements for the companies.

- **The battalion maintenance section plays a key training role** as it (1) evaluates the performance of new mechanics arriving in the unit and, if their performance is substandard, trains them for up to two months in the battalion motor pool; and (2) trains company-level maintenance supervisors as a cadre to impart the technical knowledge and skills supervisors need to train their subordinates.

- **Company level first-line supervisors train their subordinates** with strong emphasis on JPA's (job performance aids).

- **Methods are employed to determine and track mechanic skills** on maintenance tasks, to **qualify** mechanics on tasks on which they demonstrate proficiency, and to **certify** mechanics as maintenance professionals based on their satisfying pre-defined technical and non-technical requirements.

In summary, the OJT model provides for three types of technical training: (1) battalion maintenance section trains company first-line supervisors, (2) battalion maintenance trains new, inexperienced mechanics, and (3) company first-line supervisors train their subordinates.

Related MPS(O) Project Tasks

MPS(O) project tasks linked to development of the OJT model are described briefly below.

- **Define school/OJT transition.** Work on this task will lead to the development of tests to assess the skill of new arrivals in the unit. Test results will affect the placement of new arrivals in the OJT system; i.e., those performing well will require less intensive OJT than those performing poorly.

- **Qualitative assessment of individual performance.** This task is directed toward developing measures that reflect the quality of mechanic performance on maintenance tasks. These measures will be used to assess the skill of mechanics on MOS tasks.

The interfaces between these tasks and the OJT model are described in greater detail later in this report.

TECHNICAL APPROACH

The project work plan[4] describes the 12-step sequence for development, implementation, and evaluation of the OJT model. The present report covers model development. Model implementation and evaluation will occur later in the project and will be reported on separately.

Our technical approach to development of the OJT model was primarily analytical. We carefully defined the Army's OJT problem, identified constraints upon unit-level OJT, specified reasonable objectives for a unit OJT program, and developed a model that would be workable in practice. Throughout analysis and development, we worked closely with the personnel in the participating Fort Carson unit to obtain their suggestions and to permit them to comment during preliminary stages of model development.

The organization of the present report reflects the major analytical steps that led to development of the model. The issues addressed are described in the paragraphs that follow.

- **Define the Army's OJT Problem**—The Army's OJT problem is multifaceted and perceptions of it vary with perspective. Our analysis considered the OJT problem from the perspectives of both the Department of the Army and the individual combat unit, and explored the official Army position on OJT. In addition, we examined the OJT approaches of other services and civilian industry to see what aspects of those approaches might be applied to Army OJT. This analysis is wide-ranging, largely subjective, and somewhat inconclusive, but it forms the philosophical backdrop for much of the OJT model that we developed. This analysis is presented in Appendix A.

- **Define OJT Constraints and Objectives**—OJT constraints are the boundaries the OJT model must work within. OJT objectives are the goals the OJT program is designed to achieve. Constraints and objectives are discussed in the next section of this report.

- **Develop Prototype OJT Model** The OJT model describes how unit OJT is performed, within unit constraints, to meet OJT objectives. The model is first presented in outline, and then in its component parts.

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[4]Harper, W. R. **Maintenance performance systems (organizational). Project work plan for year two.** Santa Barbara, California: Anacapa Sciences, Inc., Technical Report 465-18, January 1982.

- **Define Performance Certification Process and its Interface with the OJT Model**—Performance certification of a mechanic equates roughly to receiving the official stamp of professionalism. Certification is achieved by a combination of demonstrated technical proficiency and other accomplishments. The Certification section of this report describes this process and its interface with the OJT model.

- **Develop Implementation Plan**—The Plan provides the mechanism for implementing the OJT model and certification process in the field. It identifies the products needed to support the model and lists the steps necessary to introduce the model into an actual unit.

UNIT OJT CONSTRAINTS AND OBJECTIVES

This section describes the constraints upon unit-level OJT and the objectives the OJT model is designed to meet.

BACKGROUND

On-the-job training **constraints** are the boundaries within which OJT must be conducted in the unit. They include such factors as the amount of time available to train, personnel availability, and other limitations on training. The basic overall constraint on unrestricted application of OJT is, of course, the unit mission. This must and does place combat readiness at the top of the list of unit priorities. OJT falls considerably lower on the list, its position influenced by such factors as unit activities, personnel and time availability, and resources.

It is important to define OJT constraints realistically. Over-constraining OJT will result in a sub-optimal OJT model. Alternatively, if one is too optimistic and overlooks certain constraints, then the OJT model will fail in its implementation.

The OJT model is designed to meet certain objectives. The objectives primarily concern who will be trained, how they will be trained, and what types of maintenance training problems will be attacked. A number of different OJT models could be designed, depending upon OJT objectives. The objectives therefore represent results of analysis of the unit maintenance training problems that are considered to be soluble using OJT.

OJT objectives and constraints interact in the sense described above, i.e., constraints place limits on what objectives can be achieved. Thus, the OJT model represents a reasonable compromise between these two competing factors.

DERIVATION OF OJT CONSTRAINTS AND OBJECTIVES

The constraints and objectives defined below are based primarily on our analysis of the operating environment of the armor battalion at Fort Carson that is cooperating in our research. However, we believe that these constraints and objectives are similar to those of most CONUS armor battalions we have visited during the last several years.

We developed a preliminary set of constraints and objectives, reviewed them with leaders in the unit participating in the research, and then developed a final set.

OJT CONSTRAINTS

OJT constraints are as follows:

- **The OJT model must describe a means to accomplish OJT despite a shortage of qualified NCO's, personnel turbulence, and diversion of personnel.** A **shortage of qualified NCO's** means that trainers (i.e., first-line supervisors) are either not available or lack the skills required to train. The OJT model must include a method to increase the technical and training skills of first-line supervisors, as well as working mechanics. To deal with **personnel turbulence**, the OJT model must describe a simple and flexible means to conduct OJT, one that can be quickly adapted to by both new trainers and new trainees. To deal with **diversion of personnel**, the OJT model must describe a way of integrating training into ongoing maintenance work.

- **Training must cause minimum interference with ongoing work.** This constraint reflects the primary mission of a combat unit, i.e., combat readiness.

- **On-the-job training must not require additional resources or personnel.** A unit should not be required to obtain resources or personnel to support training, beyond those available through normal Army channels.

- **Training must not require the trainer (first-line supervisor) to develop lesson plans, consolidate training materials, or devote extensive effort and time to training preparation.** If the supervisor must devote much of his time to training preparation, he will have little time available for conducting training or getting the job done. The OJT model must therefore provide pre-structured training methods and materials so that supervisors can do training on jobs of opportunity, and without extensive preparation.

- **Mechanics in an average company can devote a maximum of four continuous hours every week to dedicated training activities.** The activities referred to here are unique training activities, i.e., a block of time devoted exclusively to training. This is training beyond the OJT that would occur on routine shop work.

UNIT OJT OBJECTIVES

OJT objectives are as follows:

- **Recent AIT graduates must be trained to minimal, functional levels of technical competence upon entry into the unit.** Recent AIT graduates, as

well as some mechanics transferring into the unit from other units, may lack the basic technical skills needed to function effectively in a motor pool. Such individuals must receive basic competency training before they can become productive members of a maintenance team.

- **Working mechanics must receive training to improve their technical skills.** Working mechanics are generally considered to be competent members of the maintenance team. However, they may need additional training to develop technical skills on new tasks and refresher training on tasks on which they have demonstrated a lack of proficiency.

- **First-line supervisors must receive technical training necessary to equip them to train subordinates.** The minimum technical training needed by supervisors is the same as that needed by their subordinates; supervisors must be trained first so that they may in turn train their subordinates.

- **First-line supervisors must develop the training skills needed to effectively impart their knowledge and skill to subordinates.** Possession of technical skills is a necessary but insufficient condition for conducting training. Supervisors must also systematically be trained in the basic principles of effective instruction, i.e., "how to train."

- **The model must provide a means to deal systematically with maintenance problems that are common throughout the battalion.** Many battalions suffer from certain patterns of ineffective maintenance, i.e., recurrent maintenance problems that can be attributed in large measure to lack of maintenance skill. In order to spot such common problems or trends, it is necessary for battalion maintenance to monitor company-level maintenance and to coordinate some of the training that occurs within the companies.

- In order to determine training needs, records must be kept of the skill levels of mechanics. **The model must provide a means to track the skills of individual mechanics.** Training needs are a function of existing skills. The lower these skills on a particular maintenanc task, the greater the training need. Records must be kept to track skill information. These records may be maintained manually, by computer, or by a combination of both. The method eventually selected must be simple or it will tend to be neglected. Records also provide a means to identify mechanics who have achieved certain criterion levels of skill so that they may be given recognition.

THE OJT MODEL

This section provides an overview of the OJT model, followed by a description of each block of the model. Model design tradeoffs are discussed at the end of the section.

OVERVIEW

The OJT model (Figure 1) consists of three major blocks:

(1) Assess Bn-Wide Training Needs and Train the Trainers

(2) Assess Proficiency of and Train New Arrivals, and

(3) Train Working Mechanics

The OJT model uses a three-tracked approach to training:

- Track one—Battalion maintenance section trains new, inexperienced mechanics.
- Track two—Battalion maintenance section trains company-level supervisors.
- Track three—Company-level superisors train working mechanics.

BLOCK 1—ASSESS BATTALION-WIDE TRAINING NEEDS AND TRAIN THE TRAINERS

This block of the OJT model is designed to accomplish three objectives:

- Deal systematically with maintenance problems that are common throughout the battalion and that are resolvable through training.
- Provide first-line supervisors with the prerequisite technical skills needed to train their subordinates.
- Provide first-line supervisors with the training skills needed to effectively impart their knowledge and skill to subordinates.

The Battalion Maintenance Panel

To meet the first objective, the model contains a method to identify the battalion's common, recurrent maintenance problems. The method is to assemble and use a group of senior maintenance specialists, the **battalion maintenance panel**

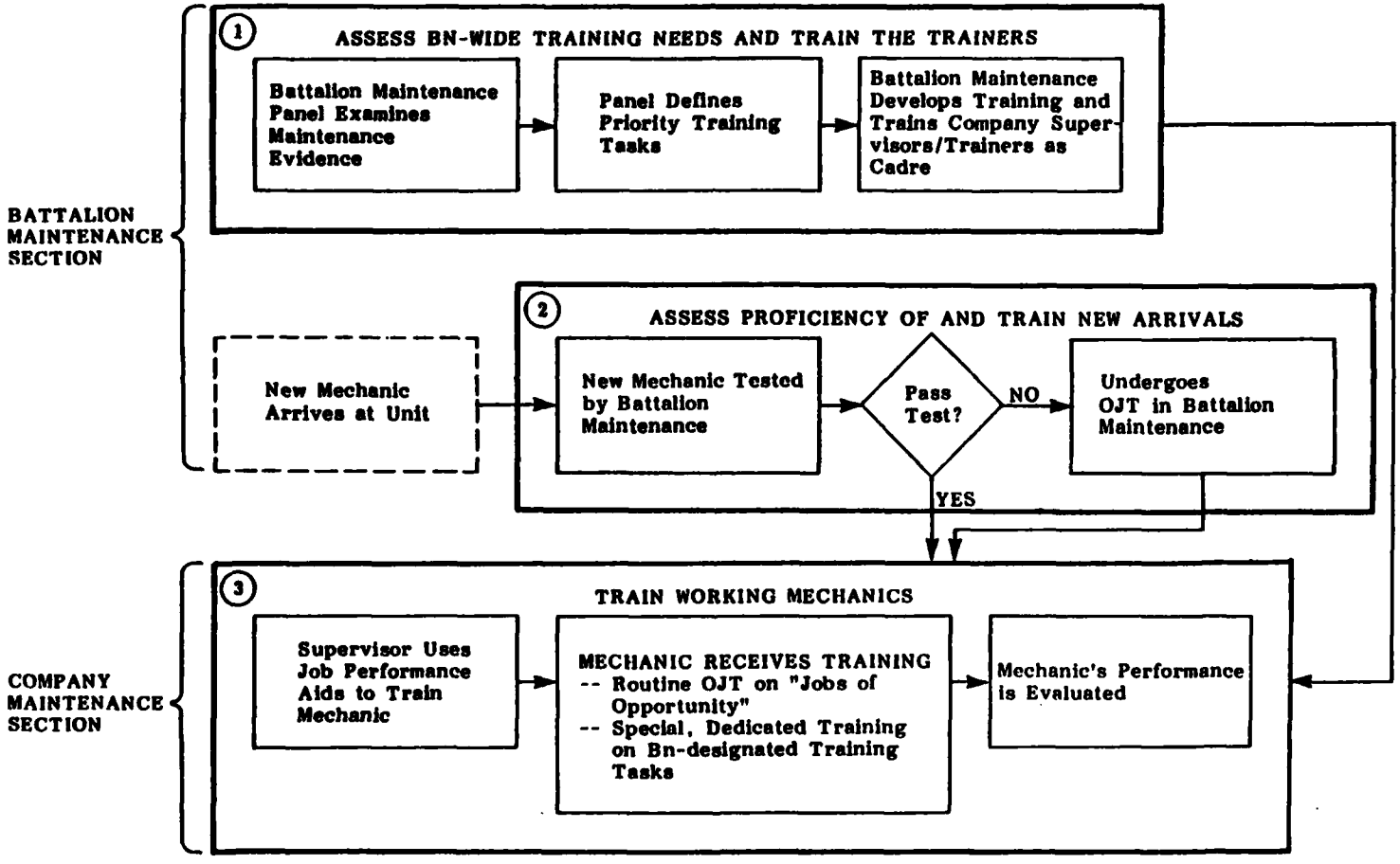

Figure 1. OJT model.

(BMP), which meets at regular intervals to discuss unit maintenance problems. The panel consists of the battalion-level executive officer, S3, maintenance officer, technician, and motor sergeant. Representatives from companies may be included if desired by panel members.

The primary function of the panel is to examine the evidence and compose a list of **priority training tasks** for the battalion. To define priority training tasks, the panel examines all evidence at its disposal, including personal observations of panel members, readiness reports, action meeting findings, and I&ES reports.

The panel has two designated functions: (1) it defines maintenance training requirements that apply battalion-wide and thereby become priority training tasks, and (2) it has the authority to **certify** mechanics. This panel is responsible for assessing the quality of maintenance in the battalion, identifying what maintenance problems are prevalent, determining which of these are soluble through training, and setting in motion the training process. In other words, the panel coordinates maintenance training battalion-wide and evaluates the results of that training.

Training Role of the Battalion Maintenance Section

Once the BMP defines the priority training tasks, the battalion maintenance section is responsible for developing and administering periodic, dedicated training on the tasks to **all** first-line supervisors in the battalion. Periodic training is scheduled weekly, bi-weekly, or monthly, depending on unit activities, the seriousness of the maintenance problems, and the amount of competing time, personnel, and resource demands on maintenance personnel. This training is formally structured and occurs at a scheduled time and specified location. The class is conducted by the battalion motor sergeant, maintenance technician, or other maintenance specialist (from a company, another battalion, direct support, MAIT, or elsewhere).

This dedicated training serves as (1) a means to "train the trainers," and (2) a way to transmit maintenance skills to company mechanics and thereby correct common maintenance problems.

During this training, the responsible instructor sets up the equipment to be repaired on a portion of the shop floor suitable for conducting his class. (The

equipment is obtained from the various companies, on a rotating basis, so that the effort in dismantling and re-assembling may be shared equally among the companies.) Manuals, tools, and test equipment are laid out beforehand to facilitate instruction. The equipment is dismantled, as necessary, so that the first-line supervisors can view the instructor's demonstration. The instructor conducts his class by making a brief presentation and then performing (or having a subordinate perform) the task while presenting a step-by-step explanation. The class concludes with hands-on performance of the task by the first-line supervisors. This equipment setup remains in place, if possible, for a period of about five working days, so that it may be used by each company to conduct its own training. Equipment scheduling and use are coordinated by the battalion maintenance section.

After first line supervisors have been trained, within one week they in turn train their subordinates, the working mechanics, during dedicated training periods. This training takes place either in the companies, if the equipment setup is available, or with the equipment setup used earlier to train the first-line supervisors. Each company must dedicate approximately four hours to train mechanics on the week's priority training task, i.e., the same "task of the week" taught to their first-line supervisors.

The training conducted by the battalion maintenance section involves a demonstration and includes hands-on practice, but this is **not** OJT in the strict sense defined in the introduction of this report. However, this training will facilitate later OJT.

The battalion maintenance section's training role is an extension of the training recommendations of the BMP. The section carries out the policy of the panel. This assumes that battalion maintenance possesses and exerts a strong influence on maintenance within the companies. Battalion maintenance needs to play a key training role because generally it has resident maintenance specialists who are more proficient than the supervisors and mechanics working at company level. Often, maintenance problems at company level are not soluble without outside assistance. This assistance is provided within the context of the model via battalion maintenance's expanded training role.

BLOCK 2—ASSESS PROFICIENCY OF, AND TRAIN, NEW ARRIVALS

Proficiency Testing

At present, unit leaders have no way of objectively gauging the skill of new mechanics who arrive at the unit. In principle, this information should be available in Job Books and AIT (advanced individual training) records, but in practice Job Books are seldom maintained and AIT records do not actually reach the battalion till much later. Without such information, it is difficult to predict what level of performance may be expected of new arrivals. Field experience with recent AIT graduates indicates that skill will be limited, since training has been received on only a small percentage of MOS tasks. Personnel at paygrade E-5 and above are generally experienced, although their experience may be specialized. The skill of mechanics in paygrades E-1 through E-4 who transfer in from other units is often unknown.

Unit leaders usually assess skill by assigning a mechanic to a duty position and then evaluating his performance. Supervisors are cautious in assigning work to the new man, lest a job be botched, and thus are only able to employ him efficiently and effectively after a prolonged breaking-in period. This period may last from several days to several weeks.

A more efficient approach to proficiency assessment is to administer a **unit entry proficiency test** to each new arrival in the unit to determine where he stands. It is impossible to test a new arrival on all of his MOS tasks, but tasks can be sampled. The test must cover both **generic** maintenance skills (i.e., use of manuals, tools, and test equipment) and skills on specific maintenance tasks. We are presently developing such tests on another project task (**Define School/OJT Transition**). When completed, the tests will be administered by battalion maintenance personnel to each new arrival in the unit at paygrade E-5 and below.

Training New Arrivals

The outcome of the test determines the new arrival's initial work assignment. If he performs well, then he goes immediately to work in his company's motor pool. If not, then he is detached from his company for a period of up to eight weeks to work and be trained in the battalion maintenance section. During the training period, the new arrival will participate in at least one complete

quarterly service, as well as the routine corrective maintenance tasks performed by battalion maintenance.

Because such training is concentrated in the battalion maintenance section, battalion maintenance personnel are able to train people more efficiently than the companies. Battalion maintenance is also better able to accommodate and efficiently use inexperienced personnel because of its larger manpower base.

This portion of the OJT model is designed to meet the objective of bringing recent AIT graduates up to minimal, functional levels of technical competence upon entry into the unit.

The initial training of new arrivals by battalion maintenance has been done successfully in the 2/32 Armor Bn, Erlangen, West Germany. The 2/32 Armor provided the inspiration for this part of the OJT model.

BLOCK 3—TRAIN WORKING MECHANICS

OJT and JPA's

Most of a mechanic's maintenance career is spent working on recurring repair jobs. Thus, this is where the majority of training must occur. This is also the most difficult environment for conducting training, as noted in our discussion of training constraints. These constraints combine to make a case for using JPA's (job performance aids) in OJT. The personnel constraints—shortages, turbulence, diversion—mean that OJT that is wholly dependent on availability and skill of individual supervisors will be variable and erratic. There are not enough skilled supervisors and even if a company has one, he may be gone tomorrow. It is preferable to reduce dependency on individual trainers by using JPA's. A properly-designed JPA permits the mechanic to work alone, productively, and to learn in the process. In addition, JPA's (once developed) meet the OJT constraints—minimum interference, no additional resources or personnel, no requirement for supervisor to develop training materials. JPA's can also support the objective of providing supervisors with training skills. The JPA can be a multi-purpose device that (1) provides maintenance procedures for the mechanic, (2) serves as a ready-made OJT lesson for the supervisor, and (3) provides the supervisor with "how to train" guidelines.

One of the most redeeming features of the JPA is its usefulness for training the instant a job of opportunity becomes available. This flexibility is one of the key requirements of effective OJT.

A sample JPA is contained in Appendix C of this report. This JPA was developed from TM 9-2350-257-1 (Volumes 1-4), the latest (Jan 1981) Army TM for the M60A1 tank. This manual contains detailed step-by-step instructions and extensive illustrations. The JPA was derived from the TM by reformatting pages to a smaller size, minor editing, and the addition of "Trainer's Guidelines," which give the first-line supervisor training hints and reminders to help him support effective OJT.

Note that this JPA is experimental in nature and has been designed to test the feasibility of the concept in the context of the overall OJT model. Widespread adoption of such JPA's by the Army would require DARCOM approval to assure that JPA's are updated concurrently with TM's.

In principle, the information in this JPA is redundant with the TM on which it is based. Except for its Trainer's Guidelines, its technical content is the same. As a practical matter, however, the typical motor pool has only one set of TM's, they are bulky, and they are not readily accessible to or usable by the mechanic who is performing a job. Moreover, he cannot keep his own personal copy of the TM to study. The JPA solves all of these packaging and ownership problems, i.e., each mechanic is provided with his own personal copies of compact JPA's which he can use on the job, refer to, or take with him to study.

Two Types of Company-Level Training

Two types of training occur at company level: (1) Routine OJT on jobs of opportunity, i.e., normal shop work; and (2) special, dedicated training on battalion-designated training tasks (discussed earlier). The JPA is an important resource for both types of training.

The JPA by itself will not make OJT effective. A prerequisite to effective use of JPA's is to train supervisors in training techniques. The supervisor must be trained, for example, to demonstrate a task in such a manner that his subordinates will follow what he is doing; to probe their knowledge; and to evaluate their

performance. This "how to train" information will be imparted to supervisors in several different ways. First, a "How to Conduct OJT" guide will be prepared for use by supervisors. This guide will contain practical guidelines for conducting OJT that are based on the cognitive principles derived from both the Year One project work and accepted training practices. A draft outline for this guide is shown in Appendix B.

Second, as mentioned above, the JPA's will contain training guidelines.

Third, Anacapa will conduct a trainer's workshop on-site when the OJT model is first implemented. This workshop will be conducted for maintenance supervisors, will be based on the "how to" guide, and will focus on training techniques.

Performance Evaluation

Performance evaluation is an important part of the training process. Without it, one has no way of assessing training effectiveness. At present, the Army relies primarily on informal methods of evaluation to determine a mechanic's proficiency. The SQT (skill qualification test) occurs too infrequently to be of use in the training context. What is needed is a measure, or set of measures, which is easy to administer, sensitive, and which accurately reflects mechanic technical proficiency.

At present, the I&ES provides a simple and straightforward method to keep track of task experience on an individual mechanic basis. The I&ES tracks how many times each mechanic has performed each maintenance task. We are currently developing measures of work quality on another project task (**Qualitative Assessment of Individual Performance**). Eventually, some or all of the measures being developed will be integrated into the OJT model. This will permit the supervisor to evaluate the performance of each mechanic on each maintenance task he performs. The evaluation procedure has not yet been defined, but will probably involve an assessment of the mechanic's performance in the course of the task (sequence of steps, correctness of procedures, use of tools, etc.) and the success of the finished job. The supervisor's evaluation will thereby reflect both the quality of maintenance work and mechanic skill. In addition, the I&ES will be

used to track maintenance tasks performed by each mechanic and the elapsed times for each job.

Together, this experience, quality, and skill information can be used to infer the training needs of mechanics. The data will be systematically recorded, collected, processed, analyzed, and distributed, and will be used to (1) support the performance certification process (see next section), (2) identify skill deficiencies (see earlier discussion of battalion maintenance panel), and (3) support training evaluation by unit personnel. This information will also be used during the formal evaluation of the OJT model, as discussed later in this report (see IMPLEMENTATION PLAN).

OJT MODEL DESIGN TRADEOFFS

The biggest impact of the OJT model is upon the battalion maintenance section, which becomes responsible for developing and conducting periodic, dedicated training and for training some company mechanics. Also, it is probable that this expanded training role will eventually involve battalion maintenance in training in other ways not explicitly defined in the model.

The impact of the OJT model on the individual companies is less; they are required to participate in periodic, dedicated training, lose the labor of new mechanics who are temporarily attached to battalion maintenance while undergoing OJT, and must be more systematic in the conduct of their own OJT.

Clearly, the OJT model does place additional burdens on personnel. However, there are also payoffs and incentives in the model, the most obvious of which is that improved training results in improved maintenance, which reduces maintenance needs and increases unit readiness.

These benefits, while real enough, are not the only ones. For example, from the battalion viewpoint, increased skill at company level may translate to a reduced maintenance workload at battalion level. In addition, the battalion maintenance section's training role places it in a position to formally monitor and be able to influence maintenance throughout the entire battalion.

Having battalion maintenance train new mechanics has the obvious drawback that the company to which the new mechanic is formally assigned loses his

labor while he receives initial proficiency training. However, when he does reach his company, he has already acquired the skills needed to be productive. Therefore, his company expends less effort on initial proficiency training.

To the battalion maintenance section, exposure of new mechanics to battalion maintenance procedures should also improve understanding by company personnel of battalion maintenance requirements and may improve the way companies prepare their vehicles for battalion-performed quarterly services.

Periodic, dedicated training may appear to be the most burdensome aspect of the model. At its most intensive, such training could involve the battalion maintenance section and every company for several hours per week. However, this facet of the OJT model does not apply continuously, 52 weeks per year. It provides a mechanism to identify and correct problems that are common throughout the battalion. It permits skills to be transferred from an area of the battalion where they are abundant to an area where they are deficient. Once this transfer has occurred, maintenance problems should abate, and the amount of dedicated training can be reduced to the level needed to maintain work of acceptable quality.

PERFORMANCE CERTIFICATION MODEL

Performance certification is a widespread practice in civilian industry. The Air Force also certifies its personnel. The general procedure is that an individual is certified by his superiors after he has demonstrated a level of technical proficiency and general professional competence that meets certain preset criteria. Thus, the certification award works both as an incentive to attain technical competence and as a vehicle for giving recognition. To be effective in serving either of these functions, the certification process must be both publicized and public. Mechanics who are candidates for certification must know where they stand with respect to their peers, and how close they are to the goal. And, when all of the certification requirements have been met, the certification candidate must receive his reward in a public forum.

DEFINITIONS

Task qualification refers to the demonstration of technical proficiency on a task. In order to become a candidate for **certification** (defined below), the mechanic must qualify on a certain percentage of his MOS tasks, as well as meet additional requirements. A mechanic may qualify on a task by demonstrating to his supervisor that he can perform the task proficiently, without supervision. Qualification is not awarded for training, experience, or other skill-related factors. Rather, it is awarded for demonstration of ability to perform.

There are two requirements for task qualification: (1) that the mechanic can perform the task with an acceptable level of technical proficiency, i.e., perform it correctly, within a reasonable time, following proper safety precautions, to an acceptable quality standard, and (2) that he can perform the task without supervision. The supervisor may satisfy himself that these two criteria have been met in any one of three different ways: (1) by his **knowledge** of the mechanic's demonstrated technical proficiency in performing the task in the past, (2) by evaluating his performance on the task as **currently being performed**, or (3) by administering a **special performance test.** Performance-testing, though desirable, entails special conditions and procedures, and for this reason will probably be little used. However, this is an option that can be exercised.

Certification equates roughly to receiving the stamp of professionalism. This extends beyond technical competence into other areas. (Qualification is a matter of demonstrating technical skill alone.) A mechanic becomes eligible for certification by qualifying on a certain percentage of his MOS tasks. Certification requires more than technical proficiency, however, and includes other factors relevant to the mechanic's level of professionalism, such as maintenance experience, ability to work unsupervised, school training received, participation in extracurricular training, and recent military record. These criteria are not fixed, but are defined by the BMP (see below). In other words, to be certified, a mechanic must satisfy both technical and non-technical standards.

THE CERTIFICATION PROCESS

Overview

The certification model is illustrated in Figure 2. Three entities are involved in this model: the mechanic, his first-line supervisor, and the BMP. The BMP was discussed in the last section in the context of the OJT model, where its primary function is to identify battalion-wide training requirements. It was noted there that the BMP also has a key role in certification since it (1) sets certification standards, and (2) applies these standards and certifies qualified mechanics. These functions are shown on the top of Figure 2.

The mechanic (shown at bottom of figure) works toward certification by qualifying on maintenance tasks in his MOS. The first-line supervisor (center path) evaluates the mechanic's performance, maintains performance records, qualifies the mechanic when he has demonstrated proficiency, determines the mechanic's eligibility for certification, and, when the mechanic is qualified, recommends him to the BMP as a certification candidate.

Role of the Battalion Maintenance Panel

In performance certification the BMP sets the technical and non-technical standards for certification, evaluates certification candidates, and certifies qualified mechanics. The panel has considerable latitude in performing all of these functions.

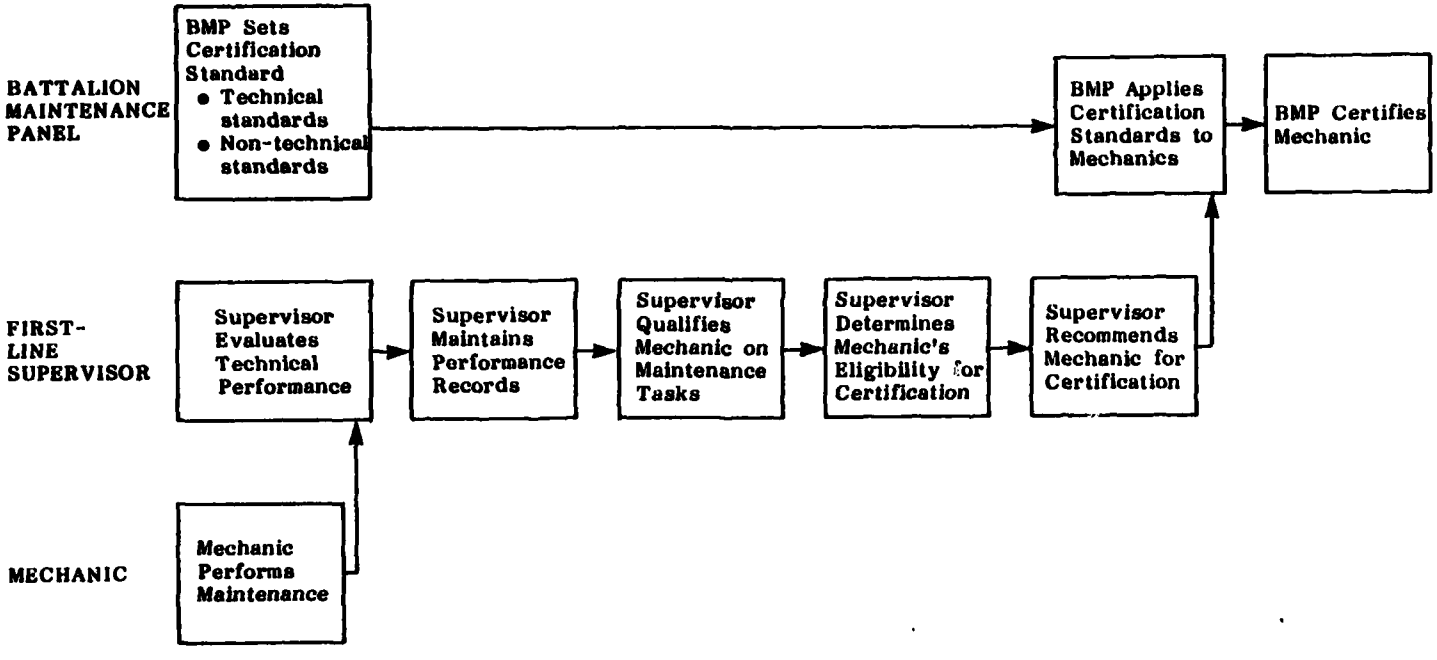

Figure 2. Certification model.

The panel must define standards because no single set of standards can apply to all units. In setting technical standards, the panel should require that the mechanic qualify on at least 70 percent of the critical maintenance tasks in his MOS. These tasks may vary from unit to unit. The objective is to set standards that require the mechanic to be technically competent on a broad range of important tasks. With such a technical standard, it is difficult for a mechanic who has specialized in a few tasks to achieve certification.

The panel has broad flexibility in defining the non-technical standards. Several relevant factors were listed above. The panel may include these or other factors, and weight each factor appropriately.

The standards must be formally defined, documented, and posted in prominent locations in the motor pool. If they are not, not only are they subject to dispute, but mechanics will be uncertain what requirements they must meet to achieve certification.

In addition to defining standards, the BMP is the only body authorized to apply them and certify mechanics. First-line supervisors in the companies can recommend mechanics for certification. The BMP reviews the qualifications of these mechanics and applies the certification standards. If the panel concludes that the mechanic is qualified, it has the authority to certify him.

The actual certification is awarded during a ceremony. The mechanic is awarded a certificate suitable for framing, and a copy of the award is placed in his permanent file. In addition, a mechanic's badge is awarded to the mechanic, if he has not received one previously. (Award of the mechanic's badge should be integrated with certification and both awards made during one ceremony.)

The Qualification Process

The first-line supervisor is the key to a mechanic's qualification. He trains the mechanic, evaluates his performance, maintains performance records, qualifies the mechanic on maintenance tasks, determines his eligibility for certification, and, when the mechanic is ready, recommends his name to the BMP.

The supervisor evaluates the mechanic's performance on each task he performs in the manner described earlier. In the typical Army shop this is now

done informally. This type of evaluation needs to be structured both for purposes of the OJT model and for certification. The supervisor should therefore follow a formal evaluation procedure, rather than responding subjectively to whatever aspect of a mechanic's work captures his attention. At the same time, the evaluation procedure must be fairly simple or it will not be used.

The requirement for simplicity also applies to the maintenance of performance records. If the unit has the I&ES, then record-keeping is automated: the supervisor completes a form each time a mechanic performs a task and the computer maintains the records. If the unit does not have the I&ES, then the supervisor is dependent on manual records such as Job Books.

The supervisor is responsible for recording: (1) what tasks the mechanic has performed, and (2) on what tasks he has qualified. In units with the I&ES, this information is maintained in computer files. An example of a special "Qualification Summary" report in draft form that could be generated by the computer at periodic intervals is shown in Figure 3.

The top four lines of the report identify the company, report title, reporting period, and equipment. The body of the report summarizes the task experience and qualifications of all mechanics in the MOS on the corrective and preventive maintenance tasks being tracked. The numbers of corrective maintenance tasks (1-19) and preventive maintenance tasks (1-3) are listed across the top of the report. Below this appear the name, task experience (how many times the task has been performed), and tasks on which each mechanic has qualified (shown by the code letter "Q." A horizontal line separates summaries of different mechanics.

The report portrays task experience and qualification differently: if a mechanic has not qualified on a task, the number of times he has performed that task appears beneath the task number; if he has qualified, then the letter "Q" appears. The supervisor can therefore determine quickly how close the mechanic is to being eligible for certification.

The report also provides information on the overall experience, qualification, and training needs of the maintenance team as a whole. The bottom of the report gives an average score per task, which is computed from the information

'G' CO. 9/99 ARMOR

TABLE 17 (63N): QUALIFICATION SUMMARY

REPORTING PERIOD ENDING: 2071* (12 MAR 82)

EQUIPMENT: M60

	CORR. MAINT. TASK NOS.														PREV. MAINT TASK NOS.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	1	2	3
JONES (63N-E3)	-	-	-	-	1	-	-	Q	5	5	7	7	Q	1	2	-	-	3	1	Q	Q	Q
SMITH (62D-E5)	Q	Q	Q	4	3	Q	Q	Q	5	5	7	7	Q	1	2	-	-	3	1	Q	Q	Q
GROSS (63N-E2)	1	2	3	1	1	1	1	1	5	5	7	7	Q	1	2	-	-	3	1	Q	Q	Q
FELDMAN (63B-E1)	-	-	-	-	1	-	-	Q	5	5	7	7	Q	1	2	-	-	3	1	Q	Q	Q
DINGLE (63N-E4)	7	7	7	7	7	7	7	Q	5	5	7	7	Q	1	2	-	-	3	1	Q	Q	Q
AVERAGE SCORE PER TASK	3	3	3	2	3	3	3	6	5	5	7	7	Q	1	2	-	-	3	1	Q	Q	Q

Figure 3. Draft I&ES qualification summary table.

appearing in the body of the report. The lower the average score on a task, the more training is needed.* This information is useful to the BMP when it is defining battalion-wide training requirements.

In addition to the I&ES report, a Maintenance Qualification Chart (Figure 4) is maintained in the motor pool shop office. This is a wall chart which contains the same information as the I&ES-generated report, but does not require a computer. Moreover, since it is posted in the working area, it has high visibility to all personnel. The wall chart is maintained by the first-line supervisor. He uses it to keep track of the maintenance experience and task qualifications of his subordinates. If the unit has the I&ES, then he can base the chart on the Qualification Summary report (Figure 3). If not, then he must use the chart itself as a record-keeping mechanism.

The chart is for the supervisor's own use in determining the skills of his subordinates and their readiness for certification. It also shows the mechanics where they stand with respect to their peers, and how far they are from certification.

The MOS 63N wall chart shown in Figure 4 summarizes experience and qualification information for mechanics on M60 corrective and preventive maintenance tasks. Task labels are used instead of task numbers. Mechanics' names, MOS's, and paygrades are listed down the left side of the chart. Task experience and qualification information appears in the cells opposite each name. The date the chart was last updated is also shown.

The BMP provides supervisors with a list of technical standards for certification. The supervisor reviews the Qualification Summary report or Maintenance Qualification Chart using these standards to determine whether or not mechanics are eligible for certification. If they are, then he forwards their names to the BMP as certification candidates. Candidates who satisfy the BMP's standards and pass the BMP's review are then certified, as described above.

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*Average score is calculated by summing the task experience values for a particular task and dividing by the number of mechanics. If a "Q" is encountered, it is set equal to 7. If all mechanics have qualified on a particular task, then the average score is set equal to "Q."

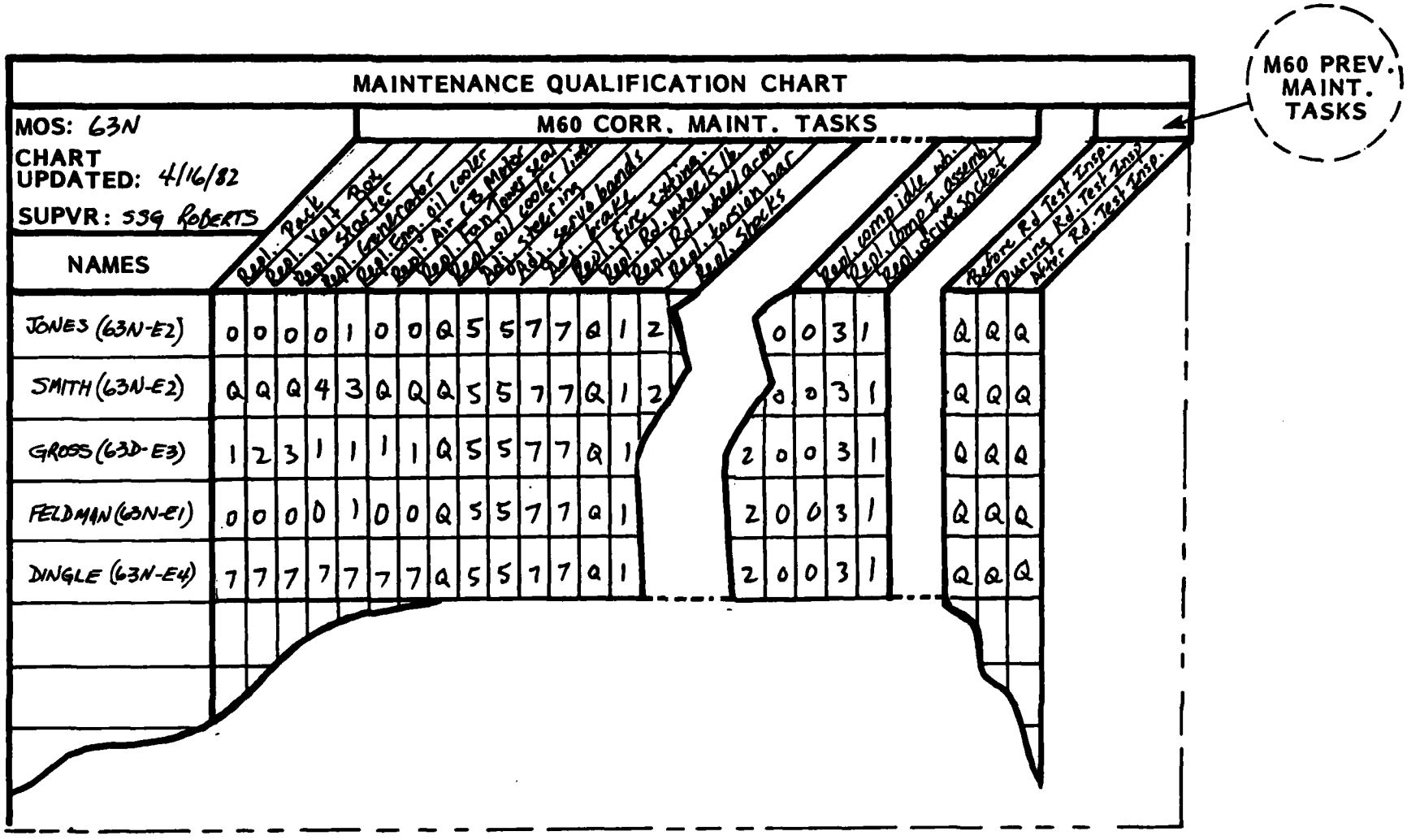

Figure 4. Proposed maintenance qualification wall chart.

IMPLEMENTATION PLAN

Implementation of the OJT and Certification models in a unit requires that key events occur in a pre-determined sequence and that procedures and materials be developed. The key events, procedures, and materials are described below and illustrated in Figure 5.

REVIEW OJT AND CERTIFICATION MODELS WITH TECHNICAL VERIFICATION GROUP

A technical verification group (TVG) will be formed to review the OJT and Certification models and the various products developed to support implementation of the models. The group will be a panel consisting of personnel from ARI, the unit in which research is being conducted, Division G4 or other designated staff, and subject-matter experts from Army schools. The present report will be disseminated to members of the TVG for review. Their comments will be taken into account in revising the OJT and certification models.

DEVELOP PROCEDURES AND MATERIALS REQUIRED TO SUPPORT IMPLEMENTATION OF THE OJT AND CERTIFICATION MODELS IN THE FIELD

The OJT and Certification models have a variety of organizational implications. Many new procedures must be established, documented, and put into operation. These procedures must be documented in a form in which they are usable by the personnel involved. The usual way to document and disseminate such procedures in a unit is with a written SOP (Standing Operating Procedure). We will prepare a draft SOP, subject to approval by the unit, that covers the following topics:

- Function of the battalion maintenance panel, membership, and role in unit maintenance assessment, definition of priority training tasks, and performance certification.
- Procedure to follow in assessing performance of new arrivals to the unit
- Role of the battalion maintenance section in training new arrivals and training company supervisors on priority training tasks
- Role of first-line supervisors in conducting OJT on jobs of opportunity and on priority training tasks
- Performance certification procedures

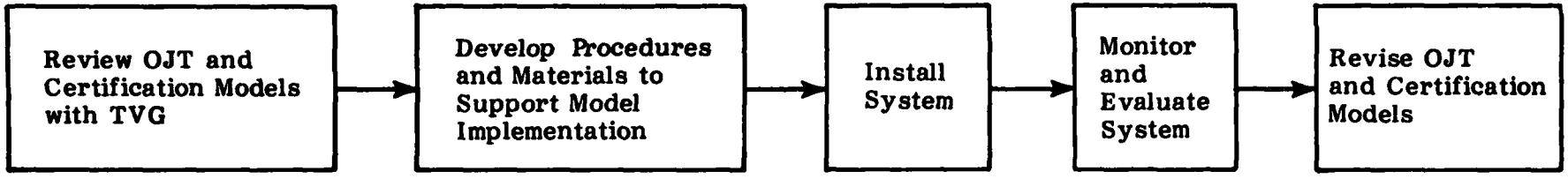

Figure 5. Key events in implementation plan.

In addition to the SOP, which is a procedural document, we will develop three types of training materials: (1) "How to Conduct OJT" guide, (2) "Train the Trainers" workshop materials, and (3) Job Performance Aids (JPA).

We will prepare a written "How to Conduct OJT" guide for first line supervisors that covers instructional principles relevant to OJT on maintenance tasks. A draft outline for this guide is contained in Appendix B of this report.

We will conduct a workshop to familiarize supervisors with the new procedures and materials used in the model. To facilitate the workshop, we will develop a set of workshop materials, including a syllabus, handouts, and supporting training materials.

We will develop JPA's for each of the maintenance tasks of MOS 63N covered by the I&ES. The use of these JPA's was described earlier in this report. A sample JPA is contained in Appendix C of this report.

INSTALL OJT AND PERFORMANCE CERTIFICATION SYSTEM

System installation will be preceded by briefings of the supervisors and maintenance managers directly affected by the system. We will conduct a "train the trainers" workshop directed at first-line supervisors who will be responsible for carrying out the bulk of training. This training will cover OJT procedures, training principles, use of JPA's, performance evaluation, and performance certification. The training will be accompanied by extensive demonstration and practice.

MONITOR AND EVALUATE THE SYSTEM

Anacapa staff will closely monitor and assist in the conduct of OJT in shops during the weeks following system installation, to assure that correct OJT and certification procedures are being followed. The progress of the OJT and performance certification system will be monitored closely by the Anacapa representative on site. He will periodically interview personnel involved to determine system shortcomings and to develop a list of recommendations for improving the system.

I&ES reports provide an additional basis for evaluating effectiveness of the system. Reports can be reviewed to determine the extent to which experience is

being gained and personnel are becoming qualified on maintenance tasks. We will also review I&ES reports to determine if OJT is having any impact on maintenance effectiveness in the unit. Results of this evaluation will be consolidated into a report that will be submitted at the end of the year. We anticipate that we will meet with the TVG during the evaluation period to discuss progress, identify problems, and seek solutions.

REVISE OJT AND CERTIFICATION MODELS

The OJT and certification models will be revised following the evaluation. Procedures and materials will be modified, as necessary, to upgrade the OJT and performance certification system. We anticipate that the modified materials will be introduced into the field during the early part of the third year of the project.

APPENDIX A

REVIEW OF OJT PROBLEMS

REVIEW OF OJT PROBLEMS

This appendix contains a brief review of Army OJT problems as seen from the perspectives of the Department of the Army and the individual combat unit. These two perspectives reveal different perceptions of the problem. The conclusion eventually reached is that, though the Army is spending tens of millions of dollars each year on training materials and other training improvement efforts, very little of that effort will directly help the first-line supervisor deliver better OJT.

As noted in the introduction to this report, the analyses described here are largely subjective. However, we believe that our conclusions are sound. These conclusions form the philosophical basis for the OJT model presented in the body of this report.

This appendix also explores the OJT approaches of the U.S. Air Force, Navy, and civilian industry for use in Army OJT.

OJT PROBLEMS - DEPARTMENT OF THE ARMY PERSPECTIVE

In early 1981, the Army reported to the Office of the Assistant Secretary of Defense that effective OJT was being hampered by several problems.[5] The Army identified the most critical of these problems, in order of importance, as shortage of NCO's; personnel turbulence; diversion of personnel; weakness in structure, support, and delivery of OJT; difficulty in identifying tasks to train through OJT; and lack of training materials. It is noteworthy that the first three problems are not really training problems, but rather constraints that increase the difficulty of conducting effective training at unit level. That is, the trainer in an OJT program is typically the first-line supervisor, and a shortage of NCO's equates to a shortage of trainers; personnel turbulence makes it difficult to achieve continuity in training; and the best planned training is wasted if the trainees are not available.

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[5] **Report on the OJT study task: on-the-job training in the department of defense.** Washington, D.C.: Defense Education and Training Executive Committee (DETEC), January 1981.

The remaining three problems are training-specific, in contrast to the first three. Together the constraints and problems produce a rather dismal picture, i.e., not only is unit OJT hampered by serious constraints, but there is a lack of training materials, it is not clear what tasks training should focus on, and the training delivery system is weak.

The Army has taken corrective action by emphasizing these four factors:

- Timely training of trainer—assuring that NCO's receive advanced school technical training when they become eligible.
- Improvements to the noncommissioned officer education system (NCOES)
- Increased emphasis on ETM (extension training materials) and BTMS (battalion training management system)
- Development of an incentive program and feedback system

The key to effective OJT is the first-line supervisor, and the first two factors acknowledge this fact. Realistically, however, it will probably be years before any actions taken along these lines can have a significant effect on OJT.

The third factor appears to be a continuation of existing Army training policy. But, since the majority of units tend neither to use ETM extensively, nor to commit the resources necessary to support the BTMS, one wonders what the real impact of this corrective action will be, even with increased emphasis.

Though we raise these doubts, we cannot really fault the corrective actions the Army has chosen. All of the actions will probably improve the OJT situation to some degree. The question is: How much?

That is, what exactly will these solutions provide to the first-line supervisor who needs to train a new mechanic in his shop—today? This supervisor may not be technically competent himself, and yet he is required to train his subordinates--to assess their skills, give them individual instruction, oversee their work, evaluate their performance, and get the job done at the same time. Where in his present career pattern is he supposed to have gained the sophisticated instructional techniques necessary to accomplish these tasks?

More bluntly, how can a training management system such as BTMS help the young NCO solve his problem? What use to him is a TEC (training extension course) lesson that portrays a maintenance task he must provide training on if there is no hands-on component to that training?

A reasonable case can be made that **none** of the proposed solutions will have a meaningful impact on unit OJT because they will not immediately improve the first-line supervisor's ability to conduct OJT. The central importance of the first-line supervisor to successful OJT, and the way the proposed solutions overlook him, are discussed in greater detail below.

OJT PROBLEMS—UNIT PERSPECTIVE

It has been estimated that the advanced individual training (AIT) received by new mechanics prepares them to perform effectively on only about 15% of their MOS tasks. Whether this is sufficient training is more of a policy question than a technical question. The Army's current policy is to give limited formal training before assigning personnel to units. This policy represents a conscious trade-off among a variety of complex, interacting factors: cost of formal training, probable length of enlistment, unit strength levels, capabilities of units to train new personnel, availability of training materials in units, and so on.

Training doctrine unequivocally states that the unit is responsible for providing individuals with the skills not taught in the schools. Operationally, this almost always equates to training by first-line supervisors. What does the Army provide to help him do his job? Consider the resources currently available:

- **Technical manuals.** The TM is the primary information source for performing maintenance jobs. Conventional TM's have received mixed user reviews. Many new mechanics find them difficult or impossible to use. "New look" TM's, with their step-by-step instructions and extensive illustrations, are receiving good user acceptance. The biggest drawback of any TM, of course, is its bulk, which makes it awkward to use on the job.

- **Extension training materials (ETM).** ETM come in audio/visual, audio, and written forms. Training Extension Course (TEC) lessons currently are available for a small percentage of the maintenance tasks of MOS 63N, the MOS for which we are developing the OJT model. However, the TEC

lesson, prototypical of ETM, is a "sit-down," individualized learning approach, more suitable for building job knowledge than "hands-on" skill.

- **"How to train" field manuals.** The Army has produced several FM's concerning the design, conduct, and management of training. Typical of these are FM 21-6, **How to Prepare and Conduct Military Training;** FM 25-2, **How to Manage Training;** and FM 25-3, **How to Conduct Training.** These FM's are directed at maintenance leaders and focus on formal training, i.e., dedicated training with designated instructors, lesson plans, tests, and so on. Such training takes considerable effort to prepare and is impractical as a means to train mechanics on a day-to-day basis in the course of their repair work.

- The **Battalion Training Management System** places a heavy emphasis on training management and on the formal technical apparatus of performance-oriented training, e.g., developing valid task, condition, and standard statements. While these concepts are valuable in a formal school environment, the typical first-line maintenance supervisor has neither the aptitude nor time to apply them to unit-level OJT on the repair shop floor.

In summary, the first-line maintenance supervisor who must conduct OJT needs more help than is provided under current Army training policies. This conclusion is startling, considering the amount of training expertise and money that have been committed to Army training over the years.

It is accurate to say that the Army lacks clear OJT doctrine. The Army's official definition of OJT, quoted in the introduction of this report, is contained in an Army dictionary, not a training document. The Army's key training regulation, AR 350-1, **Army Training**, stresses performance-oriented training but does not mention OJT. The 1975 edition of this regulation contains a definition of SOJT (supervised on-the-job training):

> A service school produced individual training program complete with pretraining and posttraining performance tests, administered to an individual in the unit/job environment by the supervisor. Individuals share the responsibility for their training with their supervisor. The service school produced SOJT course is provided to the unit commander upon request.

However, the revised edition (1981) of AR 350-1 does not refer to SOJT.

The SOJT definition given above is similar to the definition of the Job Training Program (JTP) in TRADOC Circular 351-80-7, **Job Training Program** (8 Sept 80):

> The job training program is individual extension training developed at the proponent school. It consists of training guidance and products required for training skill level one and two soldiers in a particular duty position or job in the unit.

The key features of both SOJT and JTP as defined above are that a proponent school develops a training package and exports it to the unit, thus relieving units of the training development effort. This is exactly what units--more particularly, first line supervisors--need.

Unfortunately, neither SOJT nor JTP has lived up to the promise implied in its definition. There are no SOJT or JTP packages for the MOS's we are tracking. The JTP seems to have become a kind of umbrella under which various extension training materials are provided. These are helpful for some aspects of job training, but are not complete, integrated training packages. They are individual training resources.

The Army lacks an OJT program that can be carried out at unit level by the first line supervisor. Most of the ingredients for such a program exist in the form of training resources such as Trainer's Guides, Soldier's Manuals, extension training materials, Job Books, and the SQT system. Unfortunately, very few first-line supervisors have the skill or time to combine these ingredients into a recipe for conducting OJT.

We have reviewed what is available to the maintenance supervisor charged with training responsibilities. But the question "what does the supervisor need? must still be answered. The answer lies in an analysis of what the supervisor must do to conduct effective OJT. He must:

- Diagnose the skill and knowledge deficiencies of the trainee
- Prepare a lesson--locate the available training resources, select those he needs, and organize them into an effective lesson.
- Present the lesson--give a task overview, define terms, find and locate components, demonstrate the task, observe the trainee's performance, provide feedback, and test the trainee's knowledge.

- Evaluate trainee performance--apply efficiency, effectiveness, quality, and safety standards and make an objective assessment.
- Maintain performance records on each trainee.

The answer to the question is that what the supervisor needs is (1) to be made aware of the requirement to perform these functions, (2) a simple method to carry them out, and (3) support in accomplishing them.

Awareness is a product of command interest and emphasis. A **simple method** will be the result of our current research; i.e., the OJT model encompasses such a method. **Support** is needed in reducing the amount of time and effort required in lesson preparation. To be realistic, the supervisor lacks the time to locate, select, and organize resources into training packages. He must be provided with ready-made packages that can be used at a moment's notice.

OJT APPROACHES FROM AIR FORCE, NAVY, AND INDUSTRY

This section gives a brief overview and analysis of the OJT approaches of the Air Force, Navy, and civilian industry. The OJT approaches of the U.S. Marine Corps and Coast Guard are not included in this discussion since these services' doctrine places OJT policy in the hands of the local commander. As a consequence, they lack a unified OJT approach. The section concludes by identifying features of these approaches feasible for adoption in our OJT model.

Air Force OJT

The Air Force has the best formally organized OJT system of all the services. Alone among the services, it has a specific regulation concerning OJT--AFR 50-23, **Training: On-the-job Training.** The Air Force has made the greatest effort of any of the services to research, plan, and systematize OJT, and thus has a comprehensive OJT system. The Air Force defines OJT broadly, to include **any** training that occurs on the job, including job-related "book" learning that increases job knowledge without necessarily improving hands-on skill.

The Air Force uses a "dual-channel" OJT program. The **career knowledge** channel supports the acquisition of job knowledge through self-study programs and end-of-course examinations. The **job proficiency training** channel supports the

development of hands-on skills and makes use of centrally-developed specialty training materials.

When an airman demonstrates proficiency on certain required tasks, the supervisor is authorized to certify the airman's performance..

The Air Force uses trained OJT managers at unit or base level to assist supervisors and help them manage the OJT program. The Air Force thus gives OJT a level of recognition and official support that exceeds that of any other service. The supervisor is recognized as an important OJT functionary--so much so that when an airman demonstrates proficiency on certain required tasks, the supervisor is authorized to certify the airman's performance.

The main features which distinguish Air Force OJT from that of the other services are its level of visibility, structure, and official sanction. The Army uses many training resources analogous to those of the Air Force—correspondence courses, Trainer's Guides, Soldier's Manuals, extension training materials, Job Books, etc.—but the Army has not integrated these materials into an OJT program that is recognized by the first-line supervisor.

Navy OJT

The Navy does not use the term OJT widely, but prefers "on-board training." This term includes training in actual job situations during daily operations, or the preplanned use of work resources in the work environment for training. Such training is used for the same purposes as in the Army, i.e., to upgrade or refresh existing skills or, on occasion, to cross-train an individual to develop new skills in a new occupational field. On-board training therefore is a generic term referring to any type of training a serviceman receives--even attendance at short courses at Fleet Training Centers, correspondence courses, or training on the actual job.

The Navy places a stronger emphasis on formal training in schools than do the Air Force or Army, and somewhat less emphasis on OJT-type training. In addition, it does not provide the same training support materials—for example, Soldier's Manuals, extension training materials, and Job Books—as do the other two services. Navy unit commanders use Navy-wide training guides and qualification

standards, but have great latitude and little central direction in establishing individual training programs.

One advantage that the Navy has over the other services is that many of its technical personnel are nominally available for 24 hours per day on ships that go on extended cruises. Training can therefore be intensive and uninterrupted, and the relationship of training to the combat mission is readily apparent. There are powerful "built-in" incentives to learn one's job on board ship.

The Navy is conducting considerable research in the use of JPA's (job performance aids). It's primary use of JPA's is to make new technicians functional on the job, without extensive training. However, learning occurs in the process of job performance, and JPA's facilitate this learning. The Army has also been moving in this direction with its adoption of SPAS (skill performance aids) and "new look" manuals. Both of these are outgrowths of the experimental ITDT (integrated technical documentation and training) program.

OJT in Industry

There are thousands of different civilian technical training programs, using many different training approaches. The exploration of industrial training approaches in our society would require a major study effort. For this reason, we limit our analysis to the general characteristics of civilian training programs in automotive, diesel, and heavy equipment mechanics.

There are few civilian jobs analogous to those of Army organizational-level mechanics. The Army restricts severely the complexity of the maintenance tasks it permits its mechanics to perform. Civilian mechanics generally have more wide-ranging challenging, and complex jobs. The skilled civilian mechanic, for example, is expected to be a competent troubleshooter, to perform his job unsupervised, and to be able to take equipment apart and put it back together again. The military mechanic is limited to simple troubleshooting and replacement tasks. Civilian mechanics come by their trade via a number of routes, including military training and subsequent civilian experience, but there is an increasing tendency nowadays for them to attend trade schools prior to going to work. It is common for a prospective diesel mechanic to attend a trade school for 12 months or more during which he takes classes, works on vehicles, and undergoes intensive training.

On the job the new mechanic works for an experienced supervisor, as in the Army. A mechanic at a vehicle dealer may attend resident training courses at a factory or regional site to develop advanced technical skills. Training may also be conducted at the work site, using mobile training teams from the manufacturers.

The picture sketched here cannot in any sense be considered typical or representative, although it is common in industry. There are important similarities and differences between this and the training pattern followed by an Army mechanic. Most important is that military mechanics receive much less training than their civilian counterparts. In addition, their jobs are less complex, although they may be physically demanding. The Army and civilian training patterns are also similar--early school training, developing skills through on-the-job experience, advanced technical training as the career progresses, and use of mobile training teams.

CONCLUSIONS

On-the-job training does not have a common definition among the services and industry. Training philosophies and approaches are tailored to specific needs. However, elements of these approaches hold potential for the Army.

First, the Air Force has a well-defined OJT doctrine, has integrated OJT into the airman's career pattern, and has spelled out in detail the manner in which the airman must qualify on his job, what records must be kept, what recognition will be given, and so on. In other words, Air Force OJT has **structure.** This gives it visibility, career significance, and relevance to everyday activities. The Army would benefit from greater structure in its OJT since, as noted earlier, it lacks a coherent OJT doctrine.

Second, there is increasing interest in JPA's, and all of the services have conducted research in their use. JPA's would fill a major gap in Army OJT by relieving the first-line supervisor of the need to prepare lessons.

Third, Air Force certification is formally integrated into airman training and career development. This is also true in many civilian trades. To certify a mechanic, professional standards must exist. The certified mechanic thereby has met the standards and is considered to have professional standing. Thus, the

formal certification process is an aspect of job professionalism that encourages attentiveness to work standards and increases the mechanic's pride in his job. The Army should establish a system for certifying its mechanics.

The OJT and certification models presented in the body of this report reflect the analysis and conclusions presented in this appendix.

APPENDIX B

TOPIC OUTLINE FOR "HOW TO CONDUCT OJT" GUIDE

(Note: The draft outline that follows provides a preview of the general content of the maintenance supervisor's guide for conducting OJT. As work progresses, the outline will be revised and modified.)

GUIDE TO CONDUCTING OJT (DRAFT)

I. INTRODUCTION

A. HOW THIS GUIDE IS ORGANIZED

B. DEFINITION OF OJT

C. DIFFERENCES BETWEEN OJT AND OJE

D. THE "WHO," "WHAT," AND "WHEN" OF OJT

E. THE TRAINER'S ROLE IN OJT

F. THE STEPS IN DOING OJT

1. Set the scene for training
2. Find out what the trainee knows
3. Put the job in context
4. Do the demonstration
5. Give the trainee practice
6. Give the trainee feedback
7. Evaluate trainee performance

II. TRAINING PRINCIPLES

A. FEEDBACK

B. "OVERTRAINING"

C. HELPING TRAINEES FIND AND REMEMBER INFORMATION

D. THE IMPORTANCE OF "HANDS-ON" PRACTICE

E. HOW TO USE JOB PERFORMANCE AIDS

F. THE IMPORTANCE OF PERFORMANCE EVALUATION

III. SET THE SCENE

A. THINGS THE TRAINEE MUST KNOW ABOUT OJT

1. It is designed to help him learn

2. OJT follows a prescribed sequence

3. He must make the learning effort

4. He should ask questions

5. OJT will not change repair jobs

B. DEFINE THE MAINTENANCE VERSUS TRAINING PRIORITY OF THE JOB

IV. FIND OUT WHAT THE TRAINEE KNOWS

A. ASK HIM WHAT HE KNOWS ABOUT THE JOB

B. ASK HIM WHAT HE KNOWS ABOUT SIMILAR JOBS

C. CONSIDER WHAT YOU KNOW OF HIS JOB PERFORMANCE

D. CONSIDER WHAT YOU KNOW OF HIS PERFORMANCE RECORDS

V. PUT THE JOB IN CONTEXT

A. LOCATE THE MATERIALS NEEDED TO PERFORM THE TASK

1. TM

2. Tools and test equipment

3. Replacement parts

B. LOCATE THE PARTS OF THE EQUIPMENT/COMPONENT THAT ARE BEING WORKED ON

C. IDENTIFY THE EQUIPMENT/PARTS BEING WORKED ON

D. DECIDE WHEN COMPARISON TRAINING IS NECESSARY AND HOW TO GIVE IT

E. DECIDE WHEN CLASSIFICATION TRAINING IS NECESSARY AND HOW TO GIVE IT

VI. DEMONSTRATE THE TASK

A. ADJUST DEMONSTRATION TO SUIT TRAINEE'S NEEDS

B. EXPLAIN WHAT YOU ARE DOING

C. TEST THE TRAINEE'S KNOWLEDGE AS YOU DEMONSTRATE

D. GET THE TRAINEE TO PARTICIPATE

E. SEE HOW MUCH THE TRAINEE HAS LEARNED

F. REVIEW THE JOB WITH THE TRAINEE

VII. **GIVE THE TRAINEE PRACTICE**

A. PROVIDE OPPORTUNITY FOR "HANDS-ON" PRACTICE

B. PROVIDE FEEDBACK

C. ADJUST FEEDBACK TO TRAINEE'S PERFORMANCE LEVEL

D. ASSIST TRAINEE IN BUILDING CONFIDENCE

VIII. **EVALUATE TRAINEE PERFORMANCE**

A. EVALUATE PERFORMANCE FOR YOUR PURPOSES

1. Keep record of trainee performance
2. Determine task qualification

B. EVALUATE PERFORMANCE FOR TRAINEE

1. Tell him his strengths
2. Tell him his weaknesses
3. Review correct procedures for the task

APPENDIX C

SAMPLE JOB PERFORMANCE AID (JPA)

(Note: The JPA in the pocket page following provides all the information needed by an MOS 63N mechanic to replace a shock absorber on an M60A1 tank. It also provides the maintenance supervisor with guidelines for conducting OJT during an ongoing repair job.)

TRAINER'S GUIDELINES

1. Find out what the trainee knows about the job.
2. Ensure the job materials are on hand.
   - TM
   - Tools
   - Supplies
3. Identify (for the trainee)
   - Shock absorber
   - Pins (upper and lower)
   - Keyways
   - Shock absorber yoke
4. Demonstrate the task
   - Explain what you are doing (Follow the JPA step-by-step)
   - Encourage the trainee to ask questions
5. Have the trainee repeat the task
   - Help him by noting key points/steps on JPA where necessary
   - Give him feedback during and after performance
   - Query him on task knowledge
6. Evaluate trainee's performance (use separate evaluation sheet)
   - Step-by-step sequence
   - Use of tools
   - Time to perform
   - Quality of completed job

JOB PERFORMANCE AID

M60A1 **#5**

TASK: REPLACE SHOCK ABSORBER

TOOLS NEEDED:
- Slip joint pliers
- Pinch bar, 26 inches long
- 12 lb hammer
- Long round nose pliers

SUPPLIES:
- Two cotter pins
- Shock absorber

PERSONNEL: Two men

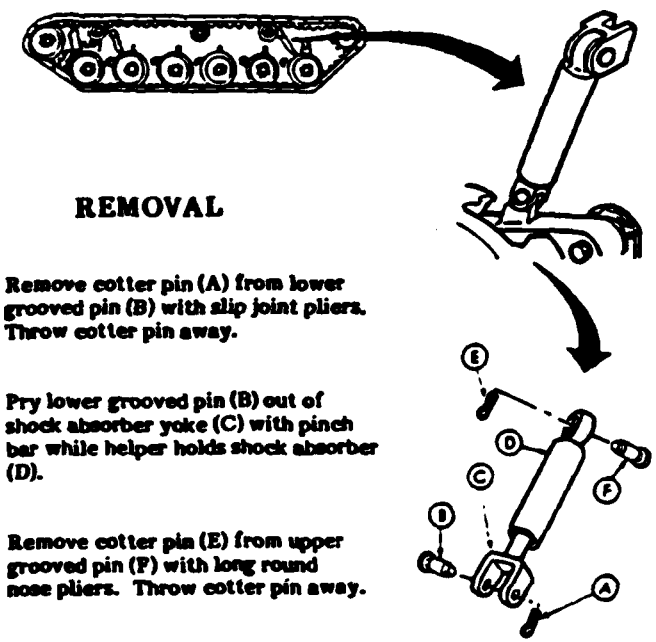
REFERENCES:
- TM 9-2350-257-20-1 Vol. 3, page 14-95
- TM 9-2350-257-10

JOB TIPS

- Draw the supplies and special tools
- Lay them out beside the job
- Have some wiping rags handy
- Be sure your helper is available and standing by before you start
- If you run into difficulties on the job, check the TM first, then call the motor sergeant

BEFORE YOU START

- Put transmission lever in *PARK* position (See TM 9-2350-257-10)
- Be sure you know which shock absorber is to be replaced.

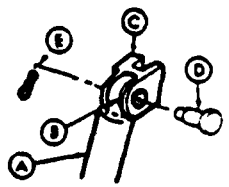


REMOVAL

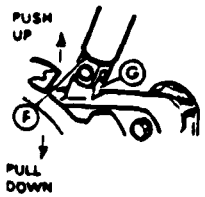
1. Remove cotter pin (A) from lower grooved pin (B) with slip joint pliers. Throw cotter pin away.
2. Pry lower grooved pin (B) out of shock absorber yoke (C) with pinch bar while helper holds shock absorber (D).
3. Remove cotter pin (E) from upper grooved pin (F) with long round nose pliers. Throw cotter pin away.
4. Drive out the upper grooved pin (F) with the hammer while the helper holds shock absorber (D).
5. Remove shock absorber (D).

INSTALLATION

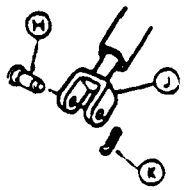
1. Aline upper eye (B) with hull mounting yoke (C) and with keyways. The helper must hold the shock absorber.
2. Insert upper grooved pin (D) in position through yoke (C) and eye (B) with fingers.
3. Install new cotter pin (E) with long round-nosed pliers.



4. Aline lower shock absorber yoke (F), with roadwheel support arm (G). Aline keyways by pushing up or pulling down on yoke.



5. Using fingers, install lower grooved pin (H) through shock absorber yoke (J), with cotter pin hole facing out.
6. Install new cotter pin (K) with slip joint pliers.



BEFORE YOU LEAVE

- CLEAN TOOLS
- RETURN TOOLS AND REFERENCE
- DISPOSE OF NON-SALVAGEABLE PARTS